IN THE SPECIFICATION:

Please amend the second full paragraph originally appearing on page 6 as follows:

~~Figure 12A-E~~ FIGS. 12A-12F are cross-sectional views ~~of an~~ of additional exemplary embodiments of the current invention.

Please amend the first full paragraph originally appearing on page 7 as follows:

The socket contact head 38 of each socket contact 32 is configured to receive a chip contact 28. Contrary to the prior art contacts which have heads in the form of spears, chisels, needles, crowns, or pinchers, exemplary embodiments of the current invention include socket contacts having heads that define grooves or recesses or cavities or cups. FIG. 2, for example, is a close-up of the socket contact head 38 depicted in FIG. 1. In this cross-sectional view, one can see that the socket contact head 38 comprises a first portion 40 defining a plane 41 and an opening. In this embodiment, the plane 41 is parallel to the IC chip 20 positioned within the socket 22. Similarly, a second portion 42 is parallel to plane 41 and is lower than the first portion 40, or at least farther away from the positioned IC chip 20. Joining the first portion 40 and the second portion 42 is a third portion 44. In this exemplary embodiment, the third portion 44 defines a frustum-shaped or frustoconical wall that slopes toward the center of the socket contact 32 from the first portion 40 to the second portion 42. In doing so, this socket contact head 38 offers a continuous contact region along an entire cross-sectional circumference C of the chip's contact 28. This can be seen better in the top-down view of FIG. 3. Without limiting the invention, it is believed that by providing such a continuous contact region, any force biasing the chip contact 28 and the socket contact 32 toward each other is distributed, thereby helping to maintain the integrity of the chip contact 28. It is possible that the compressive force applied to the chip contact 28 may be enough to deform it. In that case, the chip contact 28 may flatten against the third portion 44 and perhaps against the second portion 42 as well. This would serve to increase the contact region without inflicting the damage that prior art contacts would cause with their sharp pikes and corners. It should be further noted that, in this embodiment and from this viewpoint, the first portion 40 is annular, or ring-shaped.

Please amend the paragraph originally bridging pages 8 and 9 as follows:

As shown in FIG 6A, a socket contact head 538 can also be sized so that the chip contact 28 touches the socket contact head 538 where the first portion 540 and third portion 544 meet. In the FIG. 6A embodiment, the area where these two portions 540 and 544 meet defines a corner 500. As a result, it may be desirable in certain embodiments to provide a more rounded area 600, as seen in FIG. 6B, representing the transition from the first portion 640 to the third portion 644 of socket contact head 638. Further, FIG. 6C's embodiment demonstrates that it may be beneficial in some embodiments to include an area 700 providing a more gradual or rounded transition from the third portion 744 to the second portion 742 of socket contact head 738. Moreover, it is not required in some embodiments that the first and second portion be planar. The socket contact head 838 in FIG. 6D comprises a first portion 840 that curves outward in a convex manner toward the positioned IC chip 20 and its <u>chip</u> contact 28. On the other hand, the second portion 842 and third portion 844 curve inward in a concave fashion away from the positioned IC chip 20 and its <u>chip</u> contact 28. As a result, the portions 840, 842, and 844 define a contact surface 800 that is generally if not completely complementary to the shape of the chip contact 28. Specifically, the curved shape of <u>contact</u> surface 800 corresponds to the curved shape of the chip contact 28.

Please amend the first full paragraph originally appearing on page 10 as follows:

As stated above, the electrical contact head may be associated with an electrical contact body that is already known in the art. In the context of socket contacts, for example, FIG. 8 illustrates the socket contact head 38 as part of a pogo pin 46. The socket contact head 38 is connected to, if not an integral part of, an outer shell 48. The socket contact head 38 is also connected to an inner shaft 50 through a spring 52. However, if the outer shell 48 is made of an electrically conductive material, then the entire outer shell 48 is available to receive current, when all that is really needed is for current to travel from the <u>socket contact</u> head 38 to the <u>inner</u> shaft 50 through the spring 52 (as well as in the reverse direction). In addition, the hole 30 in

body 24 must be wide enough to accommodate the diameter of the outer shell 48. As technology allows for smaller chip contacts 28 that may then be more closely packed together, it is desirable to densify the socket holes 30 in a corresponding manner. The additional width needed for the outer shell 48 runs counter to that desire.

Please amend the first full paragraph originally appearing on page 11 as follows:

Another electrical contact body that is known in the art is the buckle beam, and the current invention includes electrical contact heads such as the ones described above attached to such a body. However, to avoid the problems associated with buckle beams, the current invention also includes within its scope embodiments such as the one in FIG. 10, wherein a socket contact 1132 comprises a socket contact head 38 and a tube 60 having at least one aperture 62. Thus, when a compressive force is applied to the socket contact 1132, at least some of that force will cause the tube 60 to collapse in on itself, initiating the closure of the aperture 62, rather than cause the tube 60 to buckle laterally. Thus, hole 30 need not be as large as when it accommodates buckle beams. The ~~tube~~ tube 60 is, nevertheless, resilient enough to generally return to its precompression shape once the compressive force eases. Further, the tube 60 is configured to fit snugly against the socket body 24 somewhere along its length. Other embodiments have a plurality of apertures, such as FIG. 11, wherein two apertures, 62 and 64, appear at the same depth but on different sides of the tube 60. FIG. 12A depicts two apertures, 62 and 66, at different depths along the tube 60. The tube 60 in these and other embodiments is preferably made of metal such as gold, copper, beryllium copper, or stainless steel. The aperture or apertures can be formed by sawing. In addition, since it is also preferred to make the socket contact head from metal, it is possible to form the socket contact head 38 and tube 60 from the same piece of metal.

Please amend the paragraph originally bridging pages 11 and 12 as follows:

Still other embodiments include other contacts with bodies defining a generally continuous profile but for at least one deformation or deviation. For example, apertures of

different shapes may be formed. While the contacts in FIGS. 10, 11, and 12A define a rectangular profile with a deformation in the form of a second, smaller rectangle (or a slit), it is possible to define a different deformation by using a different saw blade, by using a particular etching technique, or simply by stamping a dent into the contact body. FIG. 12B exemplifies such a different deformation; in this case, a semicircular deformation 62′ is defined from a body 60′ having a generally rectangular profile defined by the body's cylindrical shape. Moreover, the contact body in the embodiments described above, as well as others, can be hollow. Methods for making such a hollow body can be similar to those known in the art for making the outer shell 48 of the pogo pin 46 depicted in FIG. 8. A hollow body allows embodiments such as the one depicted in FIG. 12C, wherein metal strips 65 and 67 integrally extend from and join cylindrical portions of the contact body 60′. That embodiment can be formed by sawing on opposite ends of the hollow body, as depicted in FIG. 12D. FIG. 12D is a top-down cross-sectional view of the contact in FIG. 12C. Saw blades 69 move in the direction indicated by arrows 71, thereby defining <u>metal</u> strips 65 and 67 from the cylindrical shell body 60′. Saw blades 69 can represent two blades that saw the body 60′ simultaneously or one saw blade that saws the body 60′ at different places and at different times. FIG. 12E is another side view of this embodiment, similar to FIG. 12C, only at a slightly different angle than that of FIG. 12C. In FIG. 12E, the <u>metal</u> strip 65 is closer to the viewer than <u>metal</u> strip 67. In response to a compressive force along the length of the contact body 60′, the <u>metal</u> strips 65 and 67 can buckle, allowing the body 60′ to at least partially close the gap 73. In yet another embodiment, seen in FIG. 12F, the <u>metal</u> strips 65 and 67 may be deformed or "pre-dented" through stamping or other methods, to encourage an inward collapse in response to compression. Once again, these embodiments can return to their shape as the compression eases.

Please amend the paragraph originally bridging pages 12 and 13 as follows:

While all-metal electrical contacts are preferable in terms of electrical conductivity, it may sometimes be preferable to use semiconductive materials for at least the body of the electrical contact, as this allows for the use of fabrication techniques that support scaling on par

with the techniques used to define the contact pitch in the IC chip that is to be tested. FIGS. 13A through 13H demonstrate such fabrication techniques that may be used in embodiments of the current invention to form an electrical contact. FIG. 13A shows a semiconductor substrate 68 that has been patterned on the top and bottom with photoresist 70 so as to define a plurality of contact bodies. For purposes of explanation, it is assumed that the substrate is made of silicon that has been doped to encourage electrical conductivity. Next, as seen in FIG. 13B, the shapes of the top and bottom of the in-process contact bodies are defined through etching. FIG. 13B indicates that an anisotropic etch has been performed on the top and bottom. The fact that plateaus 72 remain on the bottom suggests that the anisotropic etch on the bottom was either shorter in time or involved a lower etch rate than the anisotropic etch on the top; or that the openings defined by the photoresist on the bottom were larger than the openings on top. Partially defining the contacts also establishes the placement of each prospective contact relative to the other prospective contacts. Any silicon remaining between the designated contact sites continues to determine the alignment of each contact in the array of contacts until that silicon is replaced with another material. Such a step is illustrated in FIG. 13C, where the photoresist is removed and the position of each in-process contact is maintained relative to the other in-process contacts, in this case through the application of a z-axis elastomer 74 to the bottom of the ~~substrate.~~ substrate 68. The z-axis elastomer 74 is an adhesive material that is capable of conducting electricity along a dimension in response to pressure applied along that dimension. The direction of pressure is usually designated as being aligned with a z-axis, wherein the elastomer sheet is generally parallel to a plane defined by an x and y axis (and wherein the x, y, and z axes are 90° from each other). Such an elastomer is generally nonconductive along the x and y axes.

Please amend the paragraph originally bridging pages 13 and 14 as follows:

Once the alignment of the in-process contacts has been reinforced, the contacts are then singulated by removing the remaining silicon interconnecting the in-process contacts. One option for doing so is shown in FIG. 13D, wherein additional photoresist 76 is patterned to protect the tops of the in-process contacts, and the substrate 68 subsequently undergoes an

isotropic etch to form the sidewalls of the in-process contacts. Preferably, the isotropic etch is continued to completely separate the contacts 1232, as depicted in FIG. 13D. Alternatively, the isotropic etch may be used to partially define the sidewalls (FIG. 13E), with an anisotropic etch completing the singulation (FIG. 13F). Once the additional photoresist 76 has been removed, FIG. 13G shows that the array of discrete contacts 1232, along with the z-axis elastomer 74 maintaining their placement, may then be moved to a substrate 78 such as a PCB having conductive leads 80 that end under the contacts 1232. When the contacts 1232 undergo compression, the z-axis elastomer 74 provides resiliency as well as electrical communication between the contacts 1232 and the conductive leads 80. It may also be desirable in some embodiments to deposit an insulation layer 82 between the contacts 1232 for added stability. This can be accomplished with a blanket deposition of an insulating layer followed by an etchback, with photoresist protecting the contacts. The end result is the socket 1322 illustrated in FIG. 13H. As with previous sockets, an IC chip's contacts will connect with the socket's contacts 1232, and the PCB's conductive leads 80 can be wire bonded to test equipment for testing the IC chip.

Please amend the first full paragraph originally appearing on page 14 as follows:

Variations of the processes described above also fall within the scope of the current invention. For example, sidewall definition and singulation of the contacts can be accomplished with a saw such as those used to singulate dice from a wafer. In addition, there are ways to retain the alignment of the contacts 1232 other than using the z-axis elastomer 74. For example, after the step illustrated in FIG. 13B, an alternate step shown in FIG. 14A may be taken. ~~That figure~~ FIG. 14A illustrates that the photoresist 70 has been removed and another layer of resist 84 has been applied and patterned to protect the tips of the in-process contacts. FIG. 14A further indicates that the sidewalls of the in-process contacts have been defined, either through etching or sawing. Subsequently, the insulation layer 82 is provided to a desired height, and the resist 84 is removed (FIG. 14B). In this embodiment, it is the insulation layer 82 that maintains the alignment of the in-process contacts. Singulation may then be completed by etching or sawing

from the bottom of the substrate 68, the result of which is seen in FIG. 14C. The z-axis elastomer 74 may still be used, but in this embodiment, it may be initially deposited on the substrate 78, with the singulated contacts 1232 and insulation layer 82 being placed thereover.

Please amend the first full paragraph originally appearing on page 15 as follows:

In addition, a metallization step may be added to make the tips of the contacts 1232 more electrically conductive. Moreover, it should be noted that the tips of the contacts may be formed in accordance with the configurations described above for providing a contact head with a groove or recess or cavity or defining a cup shape, with the v-shaped recesses depicted in the contacts 1232 of FIGS. 13H and 14C serving as one example. As another example, the etch time, etch rate, or resist opening could be established, as is known in the art, to define a contact tip that more closely resembles the socket contact ~~head~~ head 38 of FIG. 2. The result of such a step appears in FIG 15A. A metal layer could then be provided and subsequently patterned using photoresist to define heads 1438 of the in-process contacts. Additional steps as illustrated in FIGS. 13C-13H may be performed to reach the result depicted in FIG. 15C, wherein each contact 1232 has a metallic head 1438 comprising a first portion 1540 defining a plane 1541 and an opening. In this embodiment, the plane 1541 is parallel to the substrate 78. Similarly, a second portion 1542 is parallel to plane 1541 and is lower than the first portion 1540, or at least closer to the substrate 78. Joining the first portion 1540 and the second portion 1542 is a third portion 1544. In this exemplary embodiment, the third portion 1544 defines a frustum-shaped or frustoconical wall that slopes in toward the center of the socket contact 1232 from the first portion 1540 to the second portion 1542. As an alternative to using a metallization step, it is also within the scope of the current invention to form a metal head separately and attach it to a silicon contact.